UNITED STATES DISTRICT COURT EASTERN DISTRICT OF MICHIGAN SOUTHERN DIVISION

3D SYSTEMS, INC.,

: Case No. 05-74891

Plaintiff,

: Hon. Avern Cohn

ENVISIONTEC, INC., ENVISIONTEC

GMBH, and SIBCO, INC.,

v.

Magistrate Judge Hon. R. Steven Whalen

Defendants. :

JURY DEMANDED

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AMENDED JOINT SUBMISSION OF CORRELATED CLAIM CHARTS FOR U.S. PATENT NOS. 5,630,981, 5,651,924, 5,902,537 AND 4,999,143 INCORPORATING THE SPECIAL MASTER'S CLAIMS CHARTS FILED ON JUNE 6, 2007

'981 Patent

U.S. Patent No. 5,630,981	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
1 11. [A method of producing a three-dimensional object from a [medium] photopolymer capable of selective physical transformation ¹	Not a limitation, but if deemed a limitation, then: producing a product, prototype, or model to be made which has three dimensions	moving a beam of radiation across the surface of a curable liquid to create a solid object by drawing a radiation pattern thereon	The preamble of claim 11 requires no interpretation. As to the term, photopolymer, a photopolymer is a light sensitive plastic that cures or solidifies when exposed to light.
when subjected to [prescribed radiation] light, said method comprising the steps of:	subjected to prescribed radiation: exposed to predetermined (1) electro-magnetic radiation such as infrared radiation, visible radiation (i.e., light), ultraviolet radiation or x-ray radiation; or (2) particle beams, to cause the building material to transform into a solidified state	subjected to prescribed radiation: having a radiation pattern drawn at selected locations on the surface thereof with a beam of radiation that moves across the surface of the curable liquid	The term "light" embraces light that is visible or invisible to the human eye, <i>e.g.</i> , ultraviolet light.
3 providing said [medium] photopolymer;			No interpretation is necessary.
4 providing said [prescribed radiation] light;	providing said prescribed radiation: providing the predetermined (1) electro-magnetic radiation such as infrared radiation, visible radiation (i.e., light), ultraviolet radiation or x-ray radiation; or (2) particle beams, to cause the building material to transform into a solidified state	providing said prescribed radiation: providing the beam of radiation which is configured to move across the surface of the curable liquid and draw a pattern of radiation at selected locations thereon	No interpretation is necessary. The source of the light may be stationary or moving.
5 providing data representing the three-dimensional object to be formed which was generated on CAD system;	providing design data corresponding to the object	supplying an object representation comprising horizontally-sliced object sections of constant thickness	This limitation should be interpreted as though it included the qualifying phrase "adjacent cross sectional layers of" after the word "representing." [i.e., "providing data representing adjacent cross sectional layers of the three-dimensional object to be formed which was generated on CAD system"]

¹ Words in **bold** are the terms which Defendants had requested construction. Words in [brackets] and <u>underlining</u> show where limitations from the dependent claims were incorporated into the claim by the Special Master.

U.S. Patent No. 5,630,981	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
6 forming a first cross-sectional layer of structure by	forming an initial thickness of solidified building material representing a cross-section of the object	forming a first horizontal object slice of constant thickness	No interpretation is necessary. As a matter of clarification, "forming" means curing or solidifying. A cross sectional layer is a section of the three-dimensional object
7 exposing said [medium] photopolymer to said [prescribed radiation] light;	exposing said medium to said prescribed radiation: exposing the building material to the "prescribed radiation"	exposing said medium to said prescribed radiation: moving a beam of radiation across the selected locations on the surface of the curable liquid to draw a radiation pattern thereon	made by a plane cutting through the object.
forming successive layers of [medium] photopolymer adjacent to any;	forming successive layers of medium: forming additional thicknesses of the building material	forming successive layers of medium: forming additional, curable liquid sections of constant thickness	No interpretation is necessary with the clarification of the word "forming" provided above.
9 previously formed cross-sectional layers of structure	thicknesses of the building material that have already been solidified	previously solidified, horizontally-sliced object sections of constant thickness	
10 forming and adhering successive cross-sectional layers of structure	forming and integrating additional thicknesses of solidified building material	forming and adhesively attaching additional horizontally-sliced object sections of constant thickness	No interpretation is necessary with the clarification of the word "forming" provided above.
11 to any previously formed cross-sectional layers of structure	thicknesses of the building material that have already been solidified	previously solidified, horizontally-sliced object sections of constant thickness	
12 by exposing said [medium] photopolymer to said [prescribed radiation] light in response to said data,	exposing said medium to said prescribed radiation in response to said data: subjecting the building material to the predetermined (1) electro-magnetic radiation such as infrared radiation, visible radiation (i.e., light), ultraviolet radiation or x-ray radiation; or (2) particle beams, in accordance with the design data corresponding to the object	exposing said medium to said prescribed radiation in response to said data: moving the beam of radiation across the selected locations on the surface of the curable liquid to draw a radiation pattern thereon based on the horizontally-sliced object sections of constant thickness	The "said data" referred to in this last step of claim 11 is the data which is representative of adjacent cross sectional layers of the object.
13 whereby a plurality of adhered cross-sectional layers of structure form the three-dimensional object].	two or more thicknesses of solidified building material that have been integrated	several adhesively attached, horizontally- sliced object sections of constant thickness	

'934 Patent

U.S. Patent No. 5,651,934	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
1 2. A method for stereolithographically forming a portion of a three-dimensional object	successively curing a plurality of layers of a curable medium to form a portion of a product, prototype, or model which has three dimensions	moving a beam of radiation across the surface of a curable liquid to create part of a solid object by drawing a radiation pattern thereon	No interpretation is necessary except for the description that a subsequent layer of the three-dimensional object is formed over a previously formed layer.
2 wherein a subsequent layer of the three- dimensional object	a new thickness of building material	a new section of constant thickness	Formed over means "formed on top of."
3 is formed over a	covers	solidified on top of	
4 previously formed layer of the object, comprising the steps:	a previously cured thickness of building material	previously solidified object section of constant thickness	
5 a) holding a volume of a building material having a working surface wherein the building material is capable of selective physical transformation upon exposure to prescribed synergistic stimulation;	being subjected to predetermined (1) electromagnetic radiation such as infrared radiation, visible radiation (i.e., light), ultraviolet radiation or x-ray radiation; or (2) particle beams; or (3) reactive chemicals, to cause the building material to transform into a solidified state	having a pattern of radiation drawn at selected locations on the surface thereof with a beam of radiation that moves across the surface of the curable liquid.	The term "synergistic stimulation" embraces electromagnetic radiation emitted by stationary and moving light sources, particle beams and reactive chemicals.

U.S. Patent No. 5,651,934	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
6 b) forming a uniform coating of desired layer thickness over the previously formed layer,	applying a substantially consistent layer of uncured building material of a predetermined thickness over the previously cured thickness of building material	creating a level, liquid section of constant selected thickness on top of a previously solidified object section of constant thickness by overdipping the object platform by more than the selected constant thickness of the next object section and then raising the platform to a point that is below the surface of the liquid by a distance equal to the selected constant thickness	The term "uniform" means a "smooth, level coating." After the word "coating," the phrase "of uncured building material" could be added for greater clarity of meaning. [i.e., forming a smooth, level coating of uncured building material of desired layer thickness over the previously formed layer]
7 including sweeping a [smoothing element] winged blade at least once	sweeping a smoothing element: moving an element across the uncured building material to sweep away excess material to smooth the surface of the uncured building material over the previously cured thickness	sweeping a smoothing element: sweeping away excess curable liquid by moving a device having the structure of Figures 26 or 27 of the '934 patent, or structural equivalents thereof, across the surface of the curable liquid to create a level surface on top of the previously solidified object	The step of sweeping means that a device having two wings with sides that are at angles with respect to the surface of the material is moved across the upper surface of uncured building material to sweep away excess curable liquid and thereby create a uniform coating of desired or predetermined thickness over the
9 said [smoothing element] winged blade having a plurality of substantially separate members on a lower surface thereof for contacting the building material; and	said smoothing element having a plurality of substantially separate members: the smoothing element has at least two members which are spaced from each other	said smoothing element having a plurality of substantially separate members: a device having the structure of Figures 26 or 27 of the '934 patent or equivalents thereof which contacts the curable liquid to sweep away excess material and create a level surface	previously cured layer of building material.
10 c) applying a prescribed pattern of synergistic stimulation to the building material at the working surface to transform at least a portion of the building material	subjecting the building material to a specified pattern of (1) electromagnetic radiation such as infrared radiation, visible radiation (i.e., light), ultraviolet radiation or x-ray radiation; or (2) particle beams; or (3) reactive chemicals, to cause the building material to transform into a solidified state	moving a beam of radiation across selected locations on the surface of a curable liquid to draw a radiation pattern thereon	This step covers electromagnetic radiation emitted by stationary and moving light sources, particle beams and reactive chemicals.
11 to form the subsequent layer.	form the new thickness of building material	solidify the new object section of constant thickness	To form the subsequent layer means simply the solidification or curing of the uniform coating of desired layer thickness.

'537 Patent

U.S. Patent No. 5,902,537	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
U.S. Patent No. 5,902,557			
1 81. An apparatus for forming at least a portion of a three-dimensional object	forming a part or all of a product, prototype, or model which has three dimensions	moving a beam of radiation across the surface of a curable liquid to create part or all of a solid object by drawing a radiation pattern thereon	To the extent that the preamble might be clarified for ease of understanding it can be rewritten this way: "An apparatus for making all or part of a three-dimensional
2 on a substantially cross-sectional basis	the object is built by adding successive cross-sections to one another [original] object sections which cut across an axis of the object being built	sequentially solidifying adjacent, horizontally sliced object sections of constant thickness	object by solidifying successive cross sections of the object from a curable liquid upon exposure to synergistic stimulation."
3 from a material capable of physical transformation upon exposure to synergistic stimulation, comprising:	subjected to (1) electro-magnetic radiation such as infrared radiation, visible radiation (i.e., light) ultraviolet radiation or x-ray radiation; (2) particle beams; or (3) reactive chemicals, to cause the building material to transform into a solidified state	having a radiation pattern drawn thereon with a radiation beam that moves across the surface of a curable liquid	
4 means for supplying data descriptive of the object;	§ 112 ¶ 6 means-plus-function: function: supplying data descriptive of the object structure: CAD file for storing the design data representing the object, and equivalents thereof [3D: This structure is described in the '537 Patent at col.1 ll.29-33 and col.2 ll.15-18, attached at Exhibit A1]	§ 112 ¶ 6 means-plus-function: a computer programmed to generate data files representing horizontally-sliced object sections of constant thickness function: supplying data descriptive of horizontally-sliced object sections of constant thickness structure: a computer or equivalent programmed to generate data files representing the horizontally-sliced object sections of constant thickness. [Defendants: The corresponding structure is the "slice computer" disclosed in U.S. Patent No. 5,184,307 (the "'307 Patent") at Figures 8 and 10 and at 22:43-45, 55-57, and 60-68, 53:29-33 and 53:49-63, as shown in the attached Exhibit A2. The '307 Patent is incorporated by reference in the '537 Patent.	§ 112 ¶ 6 means-plus-function: The means referred to is a computer or equivalent that supplies data that is descriptive or representative "of adjacent cross sectional layers of the object." This interpretation is consistent with the invention of the '537 Patent and provides an antecedent basis for the function of the source of synergistic claimed in the last element of this claim [i.e., function: supplying data that is descriptive or representative of adjacent cross sectional layers of the object structure: a computer or equivalent]
5 a container for containing a volume of			No interpretation is necessary

U.S. Patent No. 5,902,537	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
material having a working surface;			
6 an applicator	a device which applies and smoothes the building material [agreed]	a device which applies and smoothes the building material [agreed]	The parties agree that the element is a device that applies and smoothes the building material.
7 for forming layers of material	forming a thickness of unsolidified building material	depositing sections of constant thickness	The function may be expressed as "coating a building material layer on top of part or all of a previously solidified object cross
8 over at least portions of previously formed object cross-sections, the applicator having a bottom opening located in proximity to the working surface;	over at least parts of layers of building material that have been previously solidified	on top of part or all of previously solidified horizontally-sliced object sections of constant thickness	section."
9 a vacuum pump coupled to the applicator for drawing up material from the working surface through the bottom opening and into the applicator;	device which creates a difference in pressure	pump that exhausts gas from an enclosed space	It means a device that creates a difference in pressure.
10 means for sweeping the applicator across at least a portion of at least some of the previously formed object cross-sections; and	§ 112 ¶ 6 means-plus-function: function: sweeping the applicator across at least a portion of at least some of the previously formed object cross-sections structure: (1) a frame and drive system; and (2) a frame and motor-driven threaded drive shaft; and equivalents thereof [3D: This structure is described in the '537 Patent at col.37 ll.65-67 and the incorporated 5,174,931 Patent at col.8 ll.17-26, attached at Exhibit B1]	§ 112 ¶ 6 means-plus-function: a frame and motor-driven threaded shaft that sweeps the applicator across all or part of at least some of the previously solidified, horizontally sliced object sections function: sweeping the applicator across at least a portion of at least some of the previously formed object cross-sections. structure: a frame and motor-driven threaded drive shaft, and equivalents thereof. [Defendants: The corresponding structure is a motor 33 and threaded drive shaft 32 disclosed in Figure 2 and 8:17-26 of U.S. Patent No. 5,174,931 (the "'931 Patent"), as shown in the attached Exhibit B2. The '931 Patent is incorporated by reference in the '537 Patent]	§ 112 ¶ 6 means-plus-function: The language of this means-plus-function element may be defined as a "frame and motor-driven threaded shaft system" and equivalents thereof that perform the sweeping function recited in the claim. [i.e., function = sweeping the applicator across at least a portion of at least some of the previously formed object cross-sections structure = frame and motor-driven threaded shaft system and equivalents thereof]

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U.S. Patent No. 5,902,537	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
11 a source of synergistic stimulation	a device that generates the synergetic stimulation	a beam of radiation configured to move across the surface of a curable liquid and draw a radiation pattern thereon	This element means a device that generates synergistic stimulation. The device may be a stationary or moving light source, a particle beam generator or a source of reactive chemicals.
12 for exposing the layers according to the descriptive data to form the at least portion of the object from	subjecting the unsolidified thicknesses of the building material to the synergistic stimulation in accordance with the design data representing the object	moving a beam of radiation across the surface of a curable liquid to draw a radiation pattern on the unsolidified curable liquid sections of constant thickness according to the data files representing horizontally-sliced object sections of constant thickness	This function may be interpreted to read: "for exposing the layers of curable liquid according to the data descriptive of adjacent cross sectional layers of the object to form the at least portion of the object from a plurality of object cross sections."
13 a plurality of object cross-sections.	sections cut across an axis of the object	several horizontally-sliced object sections of constant thickness	

'143 Patent

U.S. Patent No. 4,999,143	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
1 35. [An apparatus for producing a three-dimensional object from a medium capable of selective physical transformation	producing a product, prototype, or model which has three dimensions	moving a beam of radiation across the surface of a curable liquid to create a solid object by drawing a radiation pattern thereon	The phrases "producing a three-dimensional object" and "exposure to synergistic stimulation" are unambiguous and need not be interpreted or limited.
2 upon exposure to synergistic stimulation	subjected to (1) electro-magnetic radiation such as infrared radiation, visible radiation (i.e., light), ultraviolet radiation or x-ray radiation; or (2) particle beams; or (3) reactive chemicals, to cause the building material to transform into a solidified state	having a radiation pattern drawn thereon with a radiation beam that moves across the surface of a curable liquid	
3 from an object representation specifying a first object surface to be spaced from a second surface by a spacing, and at least partially opposing the second surface, comprising:	from data representing the three dimensional object	from data files representing horizontally- sliced object sections of constant thickness	The phrase "from an object representation" must be construed to mean data that represents adjacent or successive cross sections of the object.
4 at least one computer programmed to form a support representation	computer having instructions to produce data relating to a support	a computer programmed to provide data files representing horizontally-sliced sections of constant thickness of a structure that has a long, slender, rectangular cross- section and which provides reinforcement to the object or portions of the object	It means that a computer programmed or having instructions to produce data relating to a support for the three-dimensional object.
5 specifying a removable support	structure that is not part of the finished object which provides reinforcement to the object or portions of the object and is capable of being separated from the object	a structure that has a long, slender rectangular cross-section, which is not part of the finished object, which provides reinforcement to the object or portions of the object, and which is easily separated from the object	In the content of the '143 Patent, a removable support is a structure that is not a part of the finished object and which provides reinforcement to the object or portions of the object and can be separated from the object.
6 to be formed in said spacing out of a material substantially layer by layer,	created in the space between the first and second surfaces by successive thicknesses of a building material	created in the space between the first and second surfaces by successively solidifying curable liquid sections of constant thickness	The support is created in the space between the first and second surfaces by successively solidifying curable liquid cross sections.

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U.S. Patent No. 4,999,143	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
and second surfaces, the path having a vertical path component which is greater than any horizontal path component; and	substantially lesser in width than in length and easy to remove after the object is formed	not greater than 1-mil CAD (computer aided design) thickness	In the context of the '143 Patent and its file history, the word "thin" means substantially smaller in width than in height to facilitate the easy removal of the support from the object.

U.S. Patent No. 4,999,143	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
means for receiving said support representation, and for forming said three-dimensional object out of said medium substantially layer by layer, and also for forming said support out of said material substantially layer by layer, in accordance with said object and support representations].	§ 112 ¶ 6 means-plus-function: function: receiving the support representation, forming the three-dimensional object out of the medium, and also forming the support out of the material substantially layer by layer, in accordance with the object and support representations structure: computer control system as well as the source of synergistic stimulation and the platform that moves the object [3D: This structure is described in the '143 Patent at col.8 II.56-59, col.11 I.46 – col.12 I.2, col.13 II.17-21, and shown in the drawings at Figs. 1, 4 and 5, attached at Exhibit C1]	§ 112 ¶ 6 means-plus-function: function: receiving the support representation, forming the three- dimensional object out of the medium substantially layer-by-layer, and forming the support out of the material substantially layer-by-layer, in accordance with the object and support representations structure: includes the following elements: (1) computer programmed to receive the data files representing the horizontally- sliced support and object sections of constant thickness and convert them to vectors, (2) a radiation beam that is configured to move across the surface of a curable liquid to sequentially solidify support and object sections of constant thickness by drawing a radiation pattern dictated by the vectors, (3) a curable liquid, (4) a control system for moving the beam of radiation, and (5) a control system for moving the platform vertically. [Defendants:The corresponding structure for item (1) is the interface computer 4 in Figure 1 of the '143 Patent, which is described at 8:51-59. In another embodiment, the corresponding structure for item (1) is the "CAD Data Conversion to Stereolithographic Layer Data Format" device identified (mistakenly) by reference numeral 21 in Figure 4 and by reference numeral 25 at 11:57-64. In a further embodiment, the corresponding structure is the "Process Computer" shown in Figure 6 and Figure 1-4 (cols. 57-58) and described at cols 55-56, as shown in the attached Exhibit C2(1).	§ 112 ¶ 6 means-plus-function: function: The identified functions are as follows: receiving the support representation; and forming the three-dimensional object and the support out of the material substantially layer by layer in accordance with the object and support representations. structure: This means includes a computer programmed to receive data files representing (a) cross sections of the object and (b) cross sections of the support, a fluid medium capable of solidification in response to synergistic stimulation, and a source of synergistic stimulation to which the material is exposed to form successive solidified layers, each at the surface of the last formed building material layer and each representing an adjacent cross section of the object and support, respectively.

U.S. Patent No. 4,999,143	3D's Claim Construction	Defendants' Claim Construction	SM Neuner's Construction
		The corresponding structure for item (2) is UV light source 26 in Figures 4 and 5, which is described at 11:50-57 and 12:51-66. In another embodiment the corresponding structure is the laser depicted in Figure 6, Figure 1-2 (cols. 45-46), and Figure 1-3 (cols. 49-50), which is also described at cols. 43-44 and 51-52. Exhibit C2(2). The corresponding structure for item (3) is curable liquid 22, which is shown in Figures 4 and 5 and described at 12:24-50. Exhibit C2(3) The corresponding structure for item (4) is computer control system 28 shown in Figure 4 and described at 11:55-67. In another embodiment, item (4) comprises a combination of the process computer and mirror driver shown in Figure 1-3 at cols. 49-50. Exhibit C2(4)	
		The corresponding structure for item (5) is also computer control system 28 shown in Figure 4 and described at 11:55-67. However, in the embodiment of Figure 1-3 (cols. 49-50) it comprises a combination of a process computer and the elevator driver shown therein. Exhibit C2(5).	

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on June 21, 2007, I electronically filed the foregoing with the Clerk of the Court using the ECF system which will send notification of such filing to the following:

R. Terrance Rader: rtr@raderfishman.com Steven Hansen: srh@raderfishman.com

I declare under penalty of perjury that the foregoing statements are true and correct.

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